CLAIMS

What is claimed is:

- 1. A method of using an optical circuit to transfer information of an information-bearing signal from a first wavelength to a second wavelength, the optical circuit having an input port, an output port, and a polarization controller in communication with a laser diode, the method comprising:
- (a) inputting into the input port an information-bearing signal having the first wavelength, the polarization controller receiving the information-bearing signal;
 - (b) the polarization controller adjusting the polarization of the information-bearing signal;
- (c) the laser diode (i) receiving the polarization-adjusted information-bearing signal from the polarization controller, and (ii) generating a converted information-bearing signal by transferring the information of the polarization-adjusted information-bearing signal from the first wavelength to the second wavelength; and
 - (d) outputting from the output port the converted information-bearing signal.
 - 2. The method of claim 1 further comprising:
 - (e) amplifying the information-bearing signal having the first wavelength.
 - 3. The method of claim 1 further comprising:
 - (e) amplifying the converted information-bearing signal.
 - 4. The method of claim 1 further comprising:
 - (e) amplifying the information-bearing signal having the first wavelength; and
 - (f) amplifying the converted information-bearing signal.
 - 5. The method of claim 1 further comprising:
- (e) filtering the converted information-bearing signal to suppress or eliminate the first wavelength.
 - 6. The method of claim 1 further comprising:
 - (e) adjusting the polarization of the converted information-bearing signal.

- 7. An all-optical wavelength converter circuit for transferring information of an information-bearing signal from a first wavelength to a second wavelength, the wavelength converter circuit comprising:
- (a) a polarization controller for (i) receiving an information-bearing signal having the first wavelength, and (ii) adjusting the polarization of the information-bearing signal; and
- (b) a laser diode in communication with the polarization controller, the laser diode generating a converted information-bearing signal by transferring the information of the polarization-adjusted information-bearing signal from the first wavelength to the second wavelength.
 - 8. The all-optical wavelength converter circuit of claim 7 further comprising:
- (c) at least one filter for filtering the converted information-bearing signal to suppress or eliminate the first wavelength; and
- (d) a routing device in communication with the polarization controller and the filter, the routing device (i) directing the information-bearing signal having the first wavelength to the polarization controller, and (ii) directing the converted information-bearing signal to the filter.
 - 9. The all-optical wavelength converter circuit of claim 8 further comprising:
- (e) an amplifier in communication with the routing device for amplifying the information-bearing signal having a first wavelength.
 - 10. The all-optical wavelength converter circuit of claim 8 further comprising:
- (e) an amplifier in communication with the filter for amplifying the filtered converted information-bearing signal.
- 11. The all-optical wavelength converter circuit of claim 8 wherein the routing device is an optical circulator.
- 12. The all-optical wavelength converter circuit of claim 8 wherein the routing device is an optical directional coupler.

- 13. The all-optical wavelength converter circuit of claim 7 further comprising:
- (c) a routing device in communication with the polarization controller, the routing device (i) directing the information-bearing signal having the first wavelength to the polarization controller, and (ii) directing the converted information-bearing signal to the filter; and
- (d) an amplifier in communication with the routing device for amplifying the converted information-bearing signal.
- 14. The all-optical wavelength converter circuit of claim 7 wherein the laser diode is a non-isolated distributed feedback laser diode.
- 15. The all-optical wavelength converter circuit of claim 7 wherein the laser diode is an external cavity laser diode.
- 16. The all-optical wavelength converter circuit of claim 7 wherein the laser diode is a Fabry-Perot laser diode.
- 17. The all-optical wavelength converter circuit of claim 6 wherein the laser diode is a pulsed laser diode.
- 18. The all-optical wavelength converter circuit of claim 7 wherein the laser diode is a solid-state laser diode.
- 19. The all-optical wavelength converter circuit of claim 7 wherein the laser diode is a fiber laser diode.
- 20. The all-optical wavelength converter circuit of claim 7 wherein the laser diode transmits the converted information-bearing signal to the polarization controller which adjusts the polarization of the converted information-bearing signal.

21. An all-optical wavelength converter circuit for transferring information of an information-bearing signal from a first wavelength to a second wavelength, the circuit comprising:

a laser diode in communication with the information-bearing signal, the laser diode transferring the information of the information-bearing signal from the first wavelength to the second wavelength using cross-gain modulation.

- 22. The all-optical wavelength converter circuit of claim 21 wherein a polarization controller adjusts the polarization of the information-bearing signal having the first wavelength prior to the laser diode transferring the information to the second wavelength.
 - 23. An optical wavelength switch comprising:

an input for receiving at least a first information-bearing signal having a first wavelength and a second information-bearing signal having a second wavelength;

at least two all-optical wavelength converter circuits, each wavelength converter circuit including a laser diode, the laser diode of one of the at least two wavelength converter circuits being in communication with one of the at least first and second information-bearing signals, the laser diode of the other of the at least two wavelength converter circuits being in communication with the other of the at least first and second information-bearing signals, wherein the laser diode in each of the wavelength converter circuits transfers information of the respective information-bearing signal to another wavelength using cross-gain modulation; and

an output for transmitting the at least first and second information-bearing signals, wherein the first information-bearing signal has the second wavelength and the second information-bearing signal has the first wavelength.

24. The optical wavelength switch of claim 23 wherein the all optical wavelength converter circuits include a polarization controller which adjusts the polarization of the information-bearing signal in communication with the laser diode prior to the laser diode transferring the information of the respective information-bearing signal to another wavelength.